

## Hom–Kularb–Dang Rice Bran Extract for the Prevention of UVB-Damage Against Human Skin Fibroblast

Swanya Yakaew<sup>1</sup>, Preeyawass Phimnuan<sup>1</sup>, Khomsan Tiensomjitr<sup>1</sup>,  
Wongnapa Nakyai<sup>2</sup>, Nitra Nuengchamnong<sup>3</sup>, Gareth Ross<sup>4</sup>,  
Malyn Ungsurungsei<sup>5\*</sup>, and Jarupa Viyoch<sup>1\*</sup>

<sup>1</sup>*Department of Pharmaceutical Technology, Faculty of Pharmaceutical Sciences and Center of Excellence for Innovation in Chemistry, Naresuan University, Phitsanulok 65000, Thailand*

<sup>2</sup>*Department of Chemistry, Faculty of Science, Ramkhamhaeng University, Bangkok 10240, Thailand*

<sup>3</sup>*Science Laboratory Center, Faculty of Science, Naresuan University, Phitsanulok 65000, Thailand*

<sup>4</sup>*Department of Chemistry, Faculty of Science, Naresuan University, Phitsanulok 65000, Thailand*

<sup>5</sup>*Research & Development Division, S & J International Enterprises Public Company Limited, Bangkok 10120, Thailand.*

\*Corresponding author. E-mail: jarupav@nu.ac.th, malyn@snjinter.com

<https://doi.org/10.12982/CMUJNS.2020.0003>

Received: March 11, 2019

Revised: May 2, 2019

Accepted: May 10, 2019

### ABSTRACT

*In this study, we investigated the protective effect of hydroglycolic crude extract of Thai red Hom–Kularb–Drice (HKD) rice bran on UVB-induced photoaging of human skin fibroblast. The HKD rice bran extract showed scavenging capacity with an EC<sub>50</sub> of 4.37±0.34 mg/mL testing using a DPPH radical scavenging assay. The structural identification of proanthocyanidins compounds was performed by Liquid chromatography-electrospray ionization-quadrupole-time-of flight mass spectrometry (LC-ESI-Q-TOF-MS) in the hydroglycolic HKD extract. These compounds were cyanidin B2 type and (epi) catechin. The extract showed a no cytotoxic response was showed in human skin fibroblast. Furthermore, the HKD extract (20 µg/mL) exhibited a protective effect in UVB irradiated primary skin fibroblast, reducing MMP-1 (matrix metalloproteinases-1) expression and increasing production of type I procollagen. This data suggests that the*

***HKD rice bran extract has potential for use as a skin anti-aging agent in cosmetic products.***

**Keywords:** Hom–Kularb–Dang rice bran extract, UVB, Human skin fibroblast, MMP-1, Type I procollagen.

**INTRODUCTION**

Skin exposure to sunlight is known to cause damage usually referred to as photoaging. The part of the electromagnetic spectrum that causes the majority of this damage is in the ultraviolet range (200-400 nm) and section which is of most concern to skin health is between the wavelengths of 280-315 nm or UVB. Chronic exposure to UVB leads to the breakdown of collagen, which is the main component of the skin extracellular matrix (ECM) and also reduces the synthesis of procollagen type I (Quan et al., 2004; Viyoch et al., 2012). Disarrangement of the collagen matrix in dermal tissue by matrix metalloproteinases (MMPs) results in UV irradiation-induced photoaging (Quan et al., 2009). The mechanism of UVB-induced collagen degradation is caused by the formation of various radical oxygen species (ROS) provoking the mitogen-activated protein (MAP) kinase pathway, which up-regulates activator protein 1 (AP-1). Activation of AP-1 induces the expression of MMPs in human skin fibroblasts (Chiang et al., 2012; Wen et al., 2012). These enzymes include MMP- 1 (interstitial collagenase- 1) , MMP- 8 ( neutrophil collagenase, collagenase-2) and MMP- 13 (collagenase-3). MMP- 1 is the main primary mediator in enhanced damage of type I collagen during UV-induced photoaging (Choi et al., 2007; Dong et al., 2008). Therefore, it has been proposed that prevention of collagenase enzymes might be a strategy for precluding UV-accelerated skin aging by reverting the balance between synthesis and collagen degradation (Ahn et al., 2012; Itsarasook et al., 2014; Park et al., 2014).

Hom–Kularb–Dang (HKD), or Thai red rice is cultivated and consumed in the northern region of Thailand for more than a decade. Several studies have reported that they are many health benefiting components present in the bran part of the rice kernel. These components functions include; free radical scavenging, antioxidation potential (Chotimarkorn et al., 2008; Butsat and Siriamornpun, 2010), immunomodulatory activity and (Chen et al., 2010) and cancer and heart disease prevention (Kannan et al., 2010; Leardkamolkarn et al., 2010; Bhupathiraju and Tucker, 2011). The compounds found include sterols, oryzanol, tocopherols, tocotrienols and phenolics (Aguilar et al., 2007; Samad, 2015). One of the more important family of compounds present in HKD are proanthocyanidins, which are known as natural strong anti-oxidants that only can be found in red fruits and red rice (Gunaratne et al., 2013; Huang and Lai, 2016).

The work presented herein investigates the protective effect of hydroglycolic HKD rice bran crude extract on MMP- 1 and type I procollagen